

XXIV. *On a large series of Nycteribiidæ, parasitic Diptera, from Ceylon.* By HUGH SCOTT, B.A. (Cantab).
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THE main object of this paper is to state to what extent variation occurs in a series of 100 specimens of *Cyclopodia sykesi*, Westwood. One of the chief difficulties in the study of Nycteribiidæ has arisen from the fact that they are usually found only in small numbers, and consequently uncertainty as to the limits of species has often arisen. For the opportunity to examine the specimens under consideration, I am indebted to the kindness of Mr. T. Bainbrigge Fletcher, Paymaster of H.M.S. *Scalark*. They were all obtained by him from 11 male specimens of *Pteropus medius* Temminck* at Barbeyrn Island, off the west coast of Ceylon, on February 23rd, 1907.

The series, consisting of 57 males and 43 females, is sufficiently large to enable one to form some opinion of the amount of individual variation exhibited by these insects. As an example of the difficulty which has arisen in previous cases from the smallness of the number of specimens obtained, the following words, written by Dr. Enderlein,† in describing a *Cyclopodia* from the Maldive Islands, may be quoted: "Ob die vorliegenden Verschiedenheiten aus individuellen Schwankungen hervorgegangen sind, kann ich nicht entscheiden. Dazu wäre ein grösseres Material nothwendig." Dr. De Meijere‡ also, in describing *C. horsfieldi* and speaking of Westwood's species of the genus, expresses some uncertainty as to whether he is dealing with specific, or only with varietal, differences; saying: "... thut sich die Frage auf, ob wir es nicht vielleicht mit Varietäten einer Art zu thun haben. Doch ist zur Entscheidung dieser Frage zunächst mehr Material nöthig."

For comparison with these specimens I have had Westwood's original type female of *C. sykesi*, described by him in his paper§; also a male and a female of *C. horsfieldi*,

* *Pteropus medius* (Temminck, Monogr. Mammal. I, 1827, p. 176)
= *Vespertilio gigantea* (Brünnich, Dyrene's Historie, I, 1782, p. 45).

† Arch. Naturg. 67. 1 (1901), p. 176.

‡ Tijdschr. Ent. 42. (1899), p. 157.

§ Tr. Zool. Soc. London, 1. (1835), p. 275.

de Meij., the property of the Cambridge Museum, which were obtained by the Skeat expedition to the Malay Peninsula, and determined by Dr. Speiser. I owe my best thanks to Professor Poulton for kindly lending the type of *C. sykesi* from the Oxford Museum.

A close comparison of the Ceylon female specimens with Westwood's type has left no doubt that they are *C. sykesi*. (The male sex was described by Westwood (*op. cit.*) as a separate species, *C. hopei*.) They are distinctly larger and darker than the type; the latter has the long bristles on the end of the abdomen conspicuously reddish, whereas in the Ceylon specimens these are more fuscous. Nevertheless, investigation has revealed no clear character separating the Ceylon females from the type of *C. sykesi*. It must be mentioned, too, that all the Ceylon specimens are preserved in spirit, while the type is in a dried condition. Though the species is not new, a description of the Ceylon series may not be out of place.

FEMALE.—Dark reddish-brown; coxæ somewhat lighter; femora much lighter, testaceous, except at the apices, where they are dark; the three cross-furrows of the tibia lie in its proximal portion. Head bearing short bristles, palps with long bristles. Thorax dorsally greyish-white at the sides; the central part darker. Under-side of the thorax covered with short, not very strong, bristles.

Basal abdominal segment. Dorsal plate with its extreme base whitish and bearing a group of very short black bristles; remainder of the plate dark red-brown, more anteriorly without bristles, the posterior portion with 3 or more irregular rows of rudimentary dark bristles at some distance from one another; hind margin of the plate with ± 6 conspicuous moderately long bristles, on either side of the body, at the lateral angle. Ventral plate with a few rudimentary bristles at its extreme base; posterior to these, 3 irregular rows of short dark bristles (the bristles become longer towards the hind margin of the segment); margin of the plate bearing the characteristic ctenidium of strong black teeth.

Penultimate abdominal segment. Whitish, covered with black tubercles ("Dornenrudimenten"). On the ventral and lateral surfaces these tubercles bear short bristles. The mid-ventral part of the hind border of the segment bears ± 7 long bristles. On the dorsal surface, the tubercles of the anterior two-thirds bear only exceedingly minute rudimentary bristles; in the middle is a bare space, having a group of much larger tubercles, of the number of which I shall speak later; on the posterior one-third the tubercles

are large, and bear the very long and strong fuscous-reddish bristles. It appears that Enderlein* had some doubt as to the number of these bristles, as Westwood's Fig. 3† does not show clearly whether one or several rows are present. It may be stated that there are 5 or 6 rows, not very regularly arranged, and behind them a narrow part of the segment without either bristles or tubercles. There is no apparent arrangement of the tubercles in definite transverse lines, such as is mentioned by Westwood.‡

Terminal segment. The chitinous plates on either side of the anus are smooth, dark, and shining; each one bears on its free margin a row of 8 long and very strong dark bristles, and immediately within this outer row is an inner row of very fine short bristles. The plate covering the genital opening is slightly broader than long; smooth, brown and chitinous, bearing short bristles; the centre of its basal portion is whitish, and of the same soft consistency as the penultimate segment. The margin of this plate has a slight median emargination, on either side of which it bears a row of about 8 short black teeth, forming a kind of ctenidium.§

The females vary greatly in appearance according to the period of gestation, as often noticed previously. Those in a less advanced stage have the abdomen greatly contracted, the posterior bristles lie together projecting backwards, the black tubercles on the integument are crowded together, and the ctenidium can be seen from above widely projecting on either side of the body. Such females sometimes measure only $4\frac{1}{2}$ mm. in length. Those in an advanced stage have the penultimate abdominal segment much swollen, with a marked constriction just behind its base; the long posterior bristles are erected, the black tubercles at some distance from one another owing to expansion of the integument; and the ctenidium is hardly visible at the sides of the body from above, since the hardness of the basal ventral plate prevents it from sharing in the expansion of the rest of the abdomen. Gravid females such as these measure 5 mm., or over, in length.

VARIATION IN THE FEMALE. When allowance is made for difference in appearance due to difference in the stage of gestation, the 43 females are remarkably constant in almost all their characters. The only appreciable variation which has been found, is in the number and arrangement

* loc. cit.

† op. cit.

‡ op. cit., p. 283.

§ These ctenidia are present also in our ♀ specimen of *O. horsfieldi*.

of the large tubercles on the bare space in the centre of the dorsal surface of the abdomen. Westwood described and figured them as being 4 in number, arranged as at the corners of a square. This is the most usual condition, and is found in some allied species. Sometimes, however, one tubercle is out of place, and the grouping irregular; and the number is not constant. Thus out of the 43 Ceylon females (see Text-fig. 1):—

34 females have the big tubercles 4 in number (Fig. 1, *a*), in some cases irregularly arranged.

4 females have 5 big tubercles (Fig. 1, *b*), with a more or less regular pentagonal arrangement.

1 female has 6 big tubercles (Fig. 1, *c*), irregularly arranged.

1 female has 7 big tubercles (Fig. 1, *d*), very irregularly placed, in an anterior group of 4 and a posterior group of 3.*

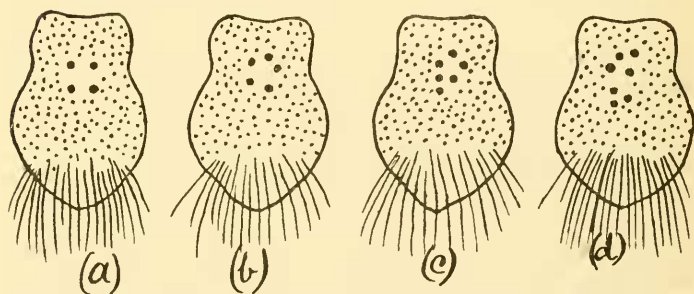


FIG. 1.—Diagrams of the dorsal surface of the penultimate abdominal segment, ♀ of *C. sykesi* Westw. to show variation in the arrangement of the large black tubercles.

These varying specimens show no departure from the normal condition, except in regard to the number and position of these tubercles. The result of the investigation is important, since it shows that the number of the tubercles cannot be relied on as a specific character. Enderlein has described the only female out of 7 specimens from the Maldivé Islands. According to his description, it corresponds closely to a typical female of *C. sykesi*, except in having 5 tubercles instead of 4 on the

* The number of big tubercles is also sometimes reduced by variation to below the normal. I have examined 7 other specimens of *C. sykesi* now in the Cambridge Museum, collected in Ceylon in 1877. Three are females, and while 2 of them have the normal 4 tubercles, the third has only 2 big tubercles, placed transversely.

bare patch.* But since out of the 43 Ceylon females, 6 are abnormal with respect to these tubercles; and since 4 out of those 6 exhibit the condition found in the Maldive female; it is possible that the latter is merely a specimen of the 5-tuberculated variety of *C. sykesi*.

It seems that some writers, judging from Westwood's figures† of *C. sykesi*, have supposed that there are 3 large tubercles on either side of the abdomen, in addition to the 4 in the middle of the dorsal surface. Kolenati, in his writings on the subject (Horæ Soc. ent. Ross., II, pp. 1-109), speaks (p. 85) of the female *C. sykesi* as having 10 large tubercles, of which 4 are in the middle of the dorsal surface of the abdomen, while the other 6 "drei jederseits am Aussenrande stehen." Enderlein also, in describing the female from the Maldives, states that "Die in der Westwood'schen Figur bei *C. sykesi* angegebenen seitlichen grösseren Dornenrudimenten fehlen vorliegendem Thier." But Westwood's type of *C. sykesi* has no large lateral tubercles on the abdomen, neither have the Ceylon females. Moreover Westwood (op. cit., p. 283) only says of the abdomen that "its coriaceous part . . . is covered . . . with minute shining black tubercles, 4 of which, on the centre of the abdomen, are of a larger size." But though he makes no mention of 3 large tubercles on either side, yet he has in his figures drawn the 3 spiracles of each side in such a manner that they exactly resemble the large tubercles in the centre. This is the case in his Figs. 3, 17, and 18 (op. cit.). He says of the abdomen that "at each side above, between the basal corneous articulation and the setose terminal portion, 3 circular spiracles are to be observed." Again, in his Fig. 20, similar objects are shown, and these in the explanation of the figures are called spiracles ("Fig. 20, . . . showing . . . the two posterior pairs of spiracles." p. 293, op. cit.).

Now Kolenati, at the time of writing his paper referred to above, appears not to have seen actual specimens of *C. sykesi*, but states (op. cit., p. 82) with regard to his figures of that species, that they are "Alles copien aus Westwood's On Nycteribia" (that is, Westwood's paper referred to here). It appears to be almost certain, therefore, that Westwood's figuring of the spiracles has given

* op. cit., p. 176, Text-fig. 1.

† op. cit.

rise to the erroneous conception that *C. sykesi* has 3 large lateral tubercles on either side of the abdomen in addition to the 4 central ones.

One may say, then, that the females of this series are remarkably constant, except with regard to the large dorsal tubercles. There is no variation sufficient to cause hesitation in referring all the individuals to the same species. When a distinct species, *C. horsfieldi*, is compared with the specimens, it is at once seen to be separated from them by perfectly well-marked characters. These are, the different arrangement of the long bristles on the posterior part of the abdomen: and the presence of a group of conspicuous moderately long bristles, placed ventro-laterally on either side of the penultimate abdominal segment, and extending backwards some way from its base; * the bristles in this region are not conspicuously elongated in *C. sykesi*.

MALE.—Length $4\frac{1}{2}$ – $4\frac{2}{3}$ mm. Head dark red-brown, bearing short bristles; palps with long bristles. Sides of the thorax whitish, the central portion darker posteriorly. Under-side of the thorax reddish-brown, covered with short bristles. Coxæ, trochanters, and femora distinctly lighter in colour; the femora dark apically, as in the female. Some immature specimens have the integument in a soft condition, and are very light-coloured, the legs and under-side of the thorax being especially pale.

Dorsal surface of abdomen. Very dark red-brown (excepting base of first segment), the anal segment slightly lighter and more shining. Extreme base of the basal segment whitish, bearing a group of dark rudimentary bristles; behind this a portion of the segment free from bristles; posterior portion with 4 rows of very short bristles at some distance from one another. Second and third segments almost equally long, the third often slightly more stretched out, their surfaces bearing scantily-distributed very short bristles. Fourth and fifth segments short, their surfaces free from bristles. Anal segment described below. Hind margin of the first segment without bristles except at the lateral angles, where there are on either side about 7 long bristles. Hind margins of the 2nd, 3rd, 4th and 5th segments bordered with long bristles at the sides, free from bristles for a considerable space in the middle.

Ventral surface of abdomen. First segment bearing a short basal row and 3 long rows of short bristles, and bearing the

* De Meijere, op. cit., Text-fig. 1.

strong black teeth of the ctenidium on its hind margin. 2nd and 3rd segments each bearing on its surface 3 rows of somewhat longer bristles, and on its hind margin a row of moderately long bristles quite continuous across the body. 4th segment somewhat elongated, its median portion without bristles, the lateral parts bearing bristles; in the middle of its hind margin is the small ctenidium of about 10 short, blunt, black teeth; on either side of this the margin bears long bristles. At the sides of the body, on segments 2, 3, and 4, are some stiff bristles projecting outwards.

Anal segment (Text-fig. 2). Narrow, long, tapering towards apex. Length $1\frac{1}{2}$, or more, times as great as breadth at base; breadth at apex $\frac{1}{2}$ as great as that at base. Median part of dorsal surface bare; lateral portions with bristles, which extend on to the ventral surface; apical angles bearing longer bristles. Claspers long, narrow, narrowly-pointed; reaching back almost, or quite, to the hind margin of the penultimate segment; bearing long bristles on their basal parts. The median portion of each clasper is slightly curved away from the body, so that a small space is sometimes left between the claspers and the abdomen; their apices rest on the surface of the abdomen.

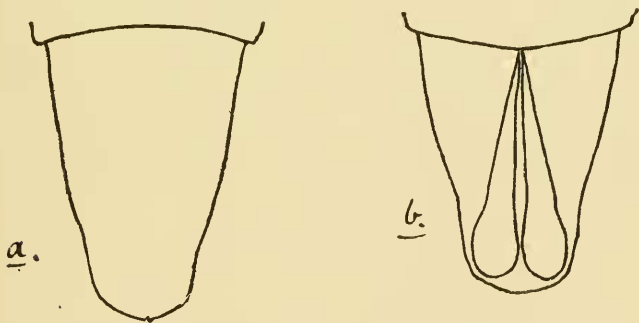


FIG. 2.—(a) Dorsal view of anal segment of ♂, (b) ventral view. In b, owing to curvative of the segment, the latter looks shorter than it really is.

AMOUNT OF VARIATION. The 57 males exhibit no appreciable variation in size, structure, or colour; except, in the case of colour, that due to differences in the degree of maturity. It can therefore be said, in summing up, of the whole series of males and females, 100 specimens, that the characters are remarkably constant. There is only one striking variation, which is that already described in the female.

In the study of *C. sykesi* and its near allies, an important point long remained undecided; that is, whether *C. hopei*, Westw., and *C. sykesi* are male and female of the same species or not. The former was originally described from 2 males from Bengal, the latter from 3 females from East India,* and Westwood then asserted the possibility of their being the same species. The characters of the males of the series discussed in this paper agree with those of *C. hopei* as given by Speiser (Arch. Naturg. 67. 1 (1901), p. 50 and Text-fig. 2b). He states that the characteristic feature of *C. hopei* lies in the form of its anal segment and claspers; the former being slender, tapering towards the apex, and some $1\frac{3}{4}$ times to twice as long as it is broad at the base; and the latter being especially long and narrow, and slenderly pointed. I have since been informed by Dr. Speiser, that as a result of his more recent investigations, *C. hopei* and *C. sykesi* are shown to be certainly the two sexes of a single species.

In the bottle with the *Cyclopodia* were also a large number of mites. Mr. N. D. T. Pearce, of Christ's College, Cambridge, who has kindly examined these, states that they are *Dermanyssidae*, of the genus *Leionathus*, Canestr.: and very closely allied to *L. arcuatus*, Berlese (Ac. Myr. Scorp. It. 53, 8), which is common on bats, especially on *V. noctula*. The mites are parasitic on the *Pteropus medius*, and are not, except by accident, on the *Cyclopodia*.

* Westwood, op. cit.